Process for transmission of data
between two networks in packet mode.

Applications involving transmissions of data from terminals of the cellular radio telephone type such as those of the GSM network are undergoing rapid development. Among these applications, the applications which consist of accessing a computer network of the INTERNET type or accessing private INTRANET networks, with protocols of the IP type such as those used for INTERNET access are particularly promising for the future. These applications make it possible to offer users a number of services such as: messaging, interactive consultation of private or public information services, transfer of files or images, remote action or remote management and others.

One mode of accessing the INTERNET from such terminals consists of establishing, with an ISP point of access to the INTERNET (ISP: "Internet Service Provider"), a connection of the "circuit mode data transfer" type which reserves, on an access network such as the switched telephone network STN, a communication channel or resource throughout the duration of the connection. The standard protocols for access to the INTERNET are then implemented, for example: SLIP or PPP, IP, TCP or UDP and the like. They offer, in particular the addressing mechanisms necessary for sending packets of information between the terminal and its correspondent via the INTERNET. This mode of access in circuit mode has the advantage of offering a transfer time of minimal and guaranteed duration on the access network, since the communication channel is entirely reserved for the terminal. It is well adapted to the services demanding the maximum of the available pass-band on the access network, such as the transfer of large files or of images, and/or demanding the minimum of to-and-fro response time on the access network, such as interactive applications with multiple successive interrogations. The main disadvantage of this circuit mode resides in the fact that the applications having low demands on response time and those where the interrogations are infrequent mobilise the same pass-band provision means, whereas these means will remain unused for a large percentage of the time.

Another mode of accessing the INTERNET from such terminals consists of using the short

messages services or possibly the USSD (Unstructured Supplementary Service Data) offering a shorter transfer time than the SMS. This mode presents the advantage of using the access network in packet or datagram mode which is more coherent with the transport mechanisms of the INTERNET network. The communication resource on the access network is used in a more optimised manner because it is momentarily freed for other terminals when there is no information to be transmitted. It is thus preferable for applications having low demands on the response time and for those where the interrogations are infrequent.

Since, in packet mode, a single channel is used in shared time by various communication means, each packet comprises, in addition to the useful data to be transmitted, the address of its sender and the address of the recipient and possibly other service data such as an order number, for example.

The service data being of fixed volume, they have associated with them a volume of useful data sufficiently large for the whole packet to be essentially composed of useful data, otherwise the advantage of the packet mode would be lost.

However, the packets of Short Messages Services SMS permit only the transmission of small packets and thus do not permit rapid transmission of a large volume of data from an INTERNET server, for example.

For this reason, INTERNET access in packet mode would *a priori* appear to be impossible. More precisely, if each INTERNET packet of useful data and signalling were transported in the limited field reserved for the useful data of a SMS packet, the INTERNET signalling would leave too little space in this field for the useful INTERNET data. The alternative possibility consisting of transporting the INTERNET packet in the signalling

field of the SMS packet is impossible because this packet is too small.

The present invention aims to propose a good compromise between the restrictions mentioned above.

To this end the invention relates to a process for transmitting data between a first data transmission device connected to a first network for transmission by packets and a second transmission device connected to a second network for transmission by packets, of the INTERNET type, each packet of one and the other of the networks comprising a field of useful data and a signalling field, the process being characterised in that the two networks are connected by a gateway for data adaptation and for controlling routing on the two networks and that the two packet fields of the second network are transported on the first network respectively into the two counterpart packet fields of the first network.

The first network may, for example, be the networks of the type GSM 900, 1800 or 1900, CDMA One (IS 95), TDMA IS 136/IS 54, CDPD, PDC, GSM-GPRS, UMTS, WCDMA, CDMA, CDMA 2000 and WAP, or cellular telephony or any other packet transmission network type which may or may not be telephonic and/or cellular.

The proposed solution thus consists of a functional merger of the two networks for unified use which has the advantage over the general encapsulation mentioned above, of using the signalling field of the first network for signalling of both networks, thus leaving the data field fully available.

The solution thus consists, in the case of the GSM network, of permitting each SMS message sent by a terminal to comprise, in the GSM signalling field, signals indicating the IP address to which the packet containing the information contained in this SMS message will be routed via the INTERNET.

The invention will be better understood with the aid of the following description of a preferred embodiment of the process of the invention, with reference to the attached drawing in which:

- Figure 1 illustrates a network connection according to the prior art,

- Figure 2 illustrates a network connection according to the invention, and

- Figure 3 illustrates GSM packets for INTERNET packet transport.

In Figure 1, illustrating the prior art, the device 1, in this case a terminal, is connected to the network 2 for transmission of data by packets, in this case the GSM network, which is itself connected to an access service provider 9 (ISP) via the switched telephone network STN 8, connected to the INTERNET 6 to which a device 7 is connected, in this case an information data server.

Below the diagram of the networks, four logic layers 11 to 14 are shown for the transmission of data on the GSM: layer 11: circuit mode (level 1 of the OSI (Open Systems Interconnection), layer 12: SLIP or PPP (level 2), layer 13: IP routing (INTERNET address) (level 3), layer 14: TCP or UDP or others (level 4) of transport protocol. The layers 13 and 14 becomes the layers 23 and 24 as they pass into the INTERNET 6.

Figure 2, illustrating the invention, differs from Figure 1 by the fact that the STN 8, for access in circuit mode to the INTERNET 6 (operating in packet mode), has disappeared and that the provider (ISP) of access to the INTERNET is replaced by the gateway 3, 4, 5 comprising circuits 4 for adaptation of the data transmitted, such as the format, and routing circuits 3 and 5 for transmissions on the GSM network 2 and INTERNET 6 respectively. The circuits 4 are actually a Short Messages Services Centre, SMS-C.

The IP address of the server 7, called by the terminal 1, is in this case in the layer 33 in a packet message which, in this example, is of the short message type SMS, adapted to the GSM network but which can generally be any type of packet.

The layer 33, counterpart of the layer 13, corresponds to a signalling layer (OSI level 3) and, in Figure 2, there is no longer any equivalent of the lower layers 11 and 12: all the signalling is transmitted in a packet signalling channel 17 and not in the useful band 16 (Fig. 3). The layer 34 corresponds to the layer 14.

The layers 43 and 44 on the INTERNET 6 correspond respectively to the layers 33 and 34.

Apart from the address permitting routing on the "target" network 6, it is also possible to transmit point-to-point PPP (12) connection elements in the same way.

The two networks 2 and 6 having the same property of packet transmission, the INTERNET 6 of the example can send to the GSM network 2 in the same way.

The data of higher layers (TCP, UDP or the like) are contained in the "user data" part 16, which data are transported by the SMS.

The new information elements (IEs) contain all the data necessary for formatting by the SMS-C 4 and the router 5 of the IP INTERNET packets. They comprise, in particular the address of destination of the IP packet 20 and the address of origin of the packet.

The INTERNET signalling can be kept wholly or partially as it is, with a possible adaptation of form, by extending the SMS or USSD signalling protocol by new IE (Information Element) code words representing the INTERNET signalling. This is, therefore, an over-assembly of the standard GSM protocol, making it possible, for example to send INTERNET address data via the circuits 4 and the routing circuits 3 and 5. Thus code words representing signalling of the INTERNET network 6 are added to the signalling of the packets of the GSM network 2.

The standard SMS protocol is thus consequently extended according to the INTERNET signalling, in order to take account, in particular of the IP addressing.

The gateway 3, 4, 5, and in particular the circuits 3 and 4, is similarly provided to process the

SMS protocol thus extended and in particular to process the SLIP signalling (Series Line INTERNET Protocol) and/or PPP (Point to Point Protocol). The gateway 3, 4, 5 also ensures the formatting of the packets in both directions, in order to extract and reform, in a single packet 20, the fields 18 and 19 from the GSM network 2, and to send it via the INTERNET 6 by the router 5. The reverse process, of separation of the fields 18, 19 takes place for the packets 20 coming from the INTERNET 6. The terminal 1 carries out the inverse operations to those of the gateway 3, 4, 5 and thus the GSM network 2 is transparent to the INTERNET packets 20.

These destination and origin addresses and all or part of the signalling can, conversely, possibly be illustrated for their transportation by IEs already defined by the GSM protocol but which are useless, or of no purpose, in the INTERNET access applications (for example, the telephone numbers of the sender and of the receiver of the SMS). In any case, the IEs which are useless for the INTERNET applications are not used in this case. Thus any overloading of the GSM signalling field 17 is avoided.

Figure 3 illustrates the manner of transporting each INTERNET packet on the GSM network 2.

A packet 15 in GSM format comprises the field 16 of useful data which may be up to 140 bytes, and the field 17, which is more limited, of EI signalling data or Information Elements IE. The packet 20 in the INTERNET format similarly comprises a field 18 of useful data and a field 19 of signalling data. In this case, the size of the field 18 is limited to that of the counterpart field 16. In the same way, the signalling data of the field 19 can be accommodated in the field 17.

For transportation of the INTERNET packet 20 on the GSM network 2, the two fields 18 and 19 of the packet 20 are accommodated respectively in the two counterpart fields 16 and 17 of the packet 15 in GSM format.

Thus the GSM field 16 remains reserved for the useful data and thus offers them a non-

degraded pass-band.